

REMARKS

Claims 1-23 were originally presented for examination. The Non-Final Office Action, dated July 7, 2011, rejects all pending claims.

This paper amends claims 1-3, 6, 11-14, 17, 22, and 23. Applicant is not conceding that the subject matter encompassed by claims 1-3, 6, 11-14, 17, 22, and 23 prior to this Amendment is not patentable over the art cited by the Office. Claims 1-3, 6, 11-14, 17, 22, and 23 were amended in this Amendment solely to facilitate expeditious prosecution of the application. Applicant respectfully reserves the right to pursue claims as presented prior to this Amendment, including the subject matter encompassed by claims 1-3, 6, 11-14, 17, 22, and 23 and additional claims in one or more continuing applications.

Claims 1-23 remain pending in the application.

Drawings

The office action objects to the drawings for not showing “the first position ... preventing the flow of fluid” as recited in claims 1 and 12 and the “conduit” as recited in claims 3 and 14. Applicant has amended claims 1, 3, 12, and 14 to cancel these features from the claims, which, according to the office action, overcomes the objection.

Claim Objections

The office action objects to claims 1 and 12 for the following informality: the phrase “said in rotor” appears to have a clerical error by including the word “in”. Applicant has amended the claims to remove the word, and submits the amendment overcomes the objection.

The office action objects to claims 3 and 14 for the following informality: the word “place” should be corrected to read “placed”. Applicant has amended the claims to remove the phrase containing the word, and submits the amendment renders the objection moot.

35 U.S.C. § 112

The office action rejects claims 1-23 under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claims 1 and 12 each introduce the limitation “a stationary load bearing surface” twice in the claim. Applicant has amended the claims to introduce the limitation “a stationary load bearing surface” only once to overcome any indefiniteness caused by introducing the limitation twice. Applicant submits the amendment overcomes the objection.

Claims 11 and 22 are rejected as indefinite for citing a broad range or limitation and a narrow range or limitation that falls within the broad range or limitation, and for lack of clarity. Applicant has amended the claims to remove any indefiniteness regarding the broad range and narrow range limitations and to remedy the lack of clarity. Applicant submits the amendment overcomes the objection.

Claims 2 and 13 are rejected for insufficient/improper antecedent basis for the limitation “a means for holding” as recited in these claims. Applicant has amended the claims to remove any indefiniteness regarding antecedent basis, and submits the amendment overcomes the objection.

Claim 23 is rejected for not properly referring to a limitation in the preceding claim. Applicant has amended the claim to properly refer to a limitation in the preceding claim, and submits the amendment overcomes the objection.

35 U.S.C. § 103

The office action rejects claims 1-5, 8, 12-16, 19, and 23 under 35 U.S.C. 103(a) as being unpatentable over Nichols (US Patent No. 6,453,946) in view of Welty (US Patent No. 6,904,935). Applicant respectfully traverses the rejection to the extent it is maintained against the claims as amended.

Applicant’s independent claim 1 recites, in pertinent part, a device comprising a rotor having a rotor load bearing surface and a stator having a stationary load bearing surface. The rotor load bearing surface sealably engages the stationary load bearing surface. At least one of the rotor bearing surface and the stationary load bearing surface has a diamond-like carbon-silica coating. The diamond-like carbon-silica coating provides a low friction and increased hardness.

Nichols teaches a long lifetime fluid switching valve that has facewise adjacent rotor and stator faces. The materials of these faces are designed to result in an exceptionally long lifetime

(Abstract). One face is of a fluorocarbon-containing polymer, the other face is of tungsten carbide/Carbon. The office action acknowledges that Nichols does not disclose or suggest a diamond-like carbon coating with silica and for this element relies on Welty.

Welty describes a valve having a substrate (18) with a sliding component (20) and a fixed component (22). (The reference numerals are taken from FIGS. 1 and 2). The sliding and fixed components comprise substrate made of a base material. On this base material is built a multi-layer surface structure comprised of a strengthening layer (23), which can be made of DLC (diamond-like carbon), and an amorphous diamond layer (30) deposited over the strengthening layer. These diamond layers (30) are the adjacent exterior surfaces of the valve that face each other.

Welty, however, does not describe a diamond-like carbon-silica coating on those surfaces that face and engage each other. Rather, in Welty, such surfaces are made of amorphous diamond, which is distinct from diamond-like carbon (col. 4, line 66 to col. 5, line 2). Further, Welty does not teach or suggest that this amorphous diamond layer has silica. Hence, this amorphous diamond layer provides no motivation to modify Nichols in order to have a diamond-like carbon-silica coating on its engaging rotor and stator faces.

Moreover, in Welty, it is the strengthening layer that is made of diamond-like carbon. But this strengthening layer is disposed between the substrate and the amorphous diamond layer. It does not face and engage the other surface of the valve. Hence, one of ordinary skill in the art, presented with Welty, would not think to modify Nichols's exterior tungsten carbide/carbon coating with a material of an intermediate layer, that is, a layer that does not directly engage the surface of the rotor or stator. In addition, Welty's strengthening layer lacks the silica feature of the applicant's claimed coating. Therefore, even if, for the sake of argument only, there is motivation to replace Nichols's tungsten carbide/carbon coating with Welty's diamond-like coating, the modification would still lack every feature of the applicant's coating, namely, the silica.

Nonetheless, the Office does not propose modifying Nichol's tungsten carbide/carbon

coating with either Welty's strengthening layer or with Welty's diamond layer, because such layers notably lack the silica. Thus, the Office relies upon Welty's adhesion layer (FIG. 3, ref. no. 21), because silicon is identified as a suitable adhesion layer material, and upon Welty's base material (i.e., the substrate) because it can be made of silicon.

Neither the adhesion layer nor the base material, however, is designed to engage an opposing surface of a rotor or a stator. The teachings of Welty with respect to silicon are thus irrelevant to the composition of exterior Nichols's Tungsten Carbide/Carbon coating. One of ordinary skill in the art, presented with Nichols and Welty, and seeking to increase the longevity of the opposing engaged surfaces of a valve, would be unlikely to think of modifying Nichols's exterior tungsten carbide/carbon coating based on an element found in a lower layer, such as Welty's base material or adhesion layer, not exposed to friction. If Welty's use of silicon suggests any modification to Nichols at all, it would be to modify Nichols's base material so that it is made of silicon, or to add to Nichols an intermediate adhesion layer made of silicon, but not to modify its exterior Tungsten carbide/Carbon coating to include silica. Therefore, Welty cannot be relied upon for a motivation to modify the tungsten carbide/carbon coating of Nichols's rotor or stator faces in order to produce the applicant's claimed invention. Accordingly, applicant submits that the claimed invention is not obvious in view of Nichols and Welty, and therefore respectfully requests that the rejection be withdrawn.

Independent claim 12 recites language similar to that recited in independent claim 1, and therefore is patentable for at least those reasons presented in connection with claim 1. Applicant therefore respectfully requests that the rejection against this claim also be withdrawn.

Each of the dependent claims 2-5, 8, 13-16, 19, and 23 depends directly or indirectly from one of the independent claims and inherits all elements from that independent claim, and therefore is patentable for at least those reasons presented in connection with the independent claim from which it depends. Applicant therefore respectfully requests that the rejection against these claims also be withdrawn.

The office action also rejects claims 6, 7, and 18 under 35 U.S.C. 103(a) as being

unpatentable over Nichols in view of Welty, and further in view of Doll (US Pub. No. 2006/0257663), and claims 9-11 and 20-22 over Nichols in view of Welty, and further in view of Ahlgren (US Patent No. 6,719,001).

Applicant respectfully traverses these rejections because these claims depend directly or indirectly from one of the allowable independent claims and are therefore allowable for at least this reason. Hence, the applicant respectfully requests that the rejection be withdrawn.

CONCLUSION

Applicant submits that this paper provides a response for all pending claims. Any absence of a reply to a specific rejection, issue, or comment, or to any taking of “official notice” or reliance on “common sense”, however, does not signify agreement with or concession of that rejection, issue, comment, taking of “official notice”, or reliance on “common sense”. In addition, because the arguments made above are not exhaustive, there may be reasons for patentability of any or all pending claims that have not been expressed.

In view of the amendments and arguments made herein, applicant submits that the application is in condition for allowance and requests early favorable action by the Examiner.

If the Examiner believes that a telephone conversation with the applicant’s representative would expedite allowance of this application, the Examiner is cordially invited to call the undersigned at (508) 303-0932.

Respectfully submitted,

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